

CONTENTS

PART I

SSI-9 Organizing Committee	vii
Preface	ix

PLENARY PAPERS

B. Dunn, G.C. Farrington and B. Katz, Sol-gel approaches for solid electrolytes and electrode materials	3
T.J. Mazanec, Prospects for ceramic electrochemical reactors in industry	11
K.M. Abraham and M. Alamgir, Room temperature polymer electrolytes and batteries based on them	20
S.R. Elliott, Frequency-dependent conductivity in ionically and electronically conducting amorphous solids	27

SURFACES AND INTERFACES I and II

J. Maier, Defect chemistry at interfaces	43
J. Mizusaki, H. Tagawa, T. Saito, T. Yamamura, K. Kamitani, K. Hirano, S. Ehara, T. Takagi, T. Hikita, M. Ippommatsu, S. Nakagawa and K. Hashimoto, Kinetic studies of the reaction at the nickel pattern electrode on YSZ in H ₂ -H ₂ O atmospheres	52
C. Clausen, C. Bagger, J.B. Bilde-Sørensen and A. Horsewell, Microstructural and microchemical characterization of the interface between La _{0.85} Sr _{0.15} MnO ₃ and Y ₂ O ₃ -stabilized ZrO ₂	59
T. Kawada, B.A. van Hassel, T. Horita, N. Sakai, H. Yokokawa and M. Dokiya, Porous YSZ as a surface oxygen potential probe on polarized electrodes	65
V.N. Bondarev and P.V. Pikhitsa, A dendrite model of current instability in RbAg ₄ I ₅	72
E.Kh. Kurumchin, G.K. Vdovin, A.A. Fotiev and O.N. Leonidova, A study of oxygen interaction with high-temperature superconducting materials by the isotopic exchange method	77

MICRO AND NANO STRUCTURAL MATERIALS AND COMPOSITES

S.P.S. Badwal and S. Rajendran, Effect of micro- and nano-structures on the properties of ionic conductors	83
M. Nagai and T. Nishino, Fabrication of Li ₃ PO ₄ -Al ₂ O ₃ composites by an electrochemical technique	96
C.C. Chen, M.M. Nasrallah and H.U. Anderson, Synthesis and characterization of YSZ thin film electrolytes	101
T. Scanu, J. Guglielmi and Ph. Colomban, Ion exchange and hot corrosion of ceramic composites matrices: A vibrational and microstructural study	109
Y.R. Hong, B.B. Tang, X.F. Wu and L.S. Li, A modified Caβ"-Al ₂ O ₃ structure	121
B. Zhu, Z.H. Lai and B.-E. Mellander, Structure and ionic conductivity of lithium sulphate-aluminum oxide ceramics	125
A.L. Despotuli, A.A. Shestakov and N.V. Lichkova, An external electric field effect in electron-beam lithography of RbAg ₄ I ₅ solid electrolyte film	130

INORGANIC CATION CONDUCTORS I and II

- G.A. Nazri, C. Julien and H.S. Mavi, Structure of Li_3X ($\text{X} = \text{N}, \text{P}, \text{As}$) superionic conductors: X-ray diffraction and FTIR studies 137
- W. Zhao, L. Chen, R. Xue, J. Min and W. Cui, Ionic conductivity and luminescence of Eu^{3+} -doped $\text{LiTi}_2(\text{PO}_4)_3$ 144
- I. Rom and W. Sitte, Composition dependence of chemical diffusion coefficient and ionic conductivity of α' - and α - Ag_2Te 147
- S. Ikeda, K. Nomura, K. Ito and H. Einaga, Electrical conduction mechanism in solid electrolytes with zirconium phosphate framework 153
- D. Benrabah, J.-Y. Sanchez, D. Deroo and M. Armand, Synthesis and electrochemical characterization of new bulky lithium salts 157
- V. Srirama Swaminathan, P. Balaya and C.S. Sunandana, Rapid synthesis and characterization of $\text{NH}_4\text{Ag}_4\text{I}_5$ 163
- S. Servagent and Ph. Colomban, Raman and dilatometric studies of RbAgSO_4 and TlAgSO_4 fast ion conductors 167
- R.B. Beeken, W.L. Jetzer and D.R. Smith, Ionic conduction in Cd-substituted Ag_3SBr 176
- Y. Saito, O. Nakamura and Y. Yamamoto, Preparation of uniform $\text{Na}_4\text{Zr}_2\text{Si}_3\text{O}_{12}$ particles precipitated from alkoxide solutions 180
- Y. Michiue and M. Watanabe, Synthesis and structure of new sodium titanogallate, $\text{Na}_x\text{Ti}_{2-x}\text{Ga}_{4+x}\text{O}_{10}$, containing one-dimensional channels 186
- R. Frech and G. Dharmasena, Cation effects on substitutional phase stabilization in sodium sulfate 191
- Y. Inaguma, L. Chen, M. Itoh and T. Nakamura, Candidate compounds with perovskite structure for high lithium ionic conductivity 196
- M. Itoh, Y. Inaguma, W.-H. Jung, L. Chen and T. Nakamura, High lithium ion conductivity in the perovskite-type compounds $\text{Ln}_{1/2}\text{Li}_{1/2}\text{TiO}_3$ ($\text{Ln} = \text{La}, \text{Pr}, \text{Nd}, \text{Sm}$) 203

INORGANIC ANION CONDUCTORS

- F. Krok, W. Bogusz, W. Jakubowski, J.R. Dygas and D. Bangobango, Studies on preparation and electrical conductivity of BICOVOX 211
- A.J. Francklin, A.V. Chadwick and J.W. Couves, Thermoelectric power studies of bismuth based oxides 215
- K.R. Kendall, J.K. Thomas and H.-C. zur Loye, Oxygen ion conductivity in a new class of layered bismuth oxides 221
- J.K. Thomas, K.R. Kendall and H.-C. zur Loye, Oxygen ion conductivity in $\text{BaBi}_4\text{Ti}_3\text{MO}_{14.5}$ ($\text{M} = \text{Sc}, \text{In}$ and Ga) 225
- F. Desanglois, C. Follet-Houttemane and J.C. Boivin, Phases stability and electrical properties in the Bi_2O_3 - CdO - PbF_2 system 229

T. Ishihara, H. Matsuda, Y. Mizuhara and Y. Takita, Improved oxygen ion conductivity of NdAlO_3 perovskite-type oxide by doping with Ga	234
J.R. Dygas, F. Krok, W. Bogusz, P. Kurek, K. Reiselhuber and M.W. Breiter, Impedance study of BICUVOX ceramics	239
R.N. Vannier, G. Mairesse, F. Abraham and G. Nowogrocki, Double substitutions in $\text{Bi}_4\text{V}_2\text{O}_{11}$	248
R. Kanno, K. Ohno, H. Izumi, Y. Kawamoto, T. Kamiyama, H. Asano and F. Izumi, Neutron diffraction study of the high-fluoride-ion conductor, PbSnF_4 , prepared under an HF atmosphere	253
E. Pernot, M. Anne, M. Bacmann, P. Strobel, J. Fouletier, R.N. Vannier, G. Mairesse, F. Abraham and G. Nowogrocki, Structure and conductivity of Cu and Ni-substituted $\text{Bi}_4\text{V}_2\text{O}_{11}$ compounds	259
PROTON CONDUCTORS	
H. Iwahara, T. Yajima and H. Ushida, Effect of ionic radii of dopants on mixed ionic conduction ($\text{H}^+ + \text{O}^{2-}$) in BaCeO_3 -based electrolytes	267
F. Altorfer, W. Bührer, B. Winkler, G. Coddens, R. Essmann and H. Jacobs, H^- -jump diffusion in barium-nitride-hydride Ba_2NH	272
K.D. Kreuer, E. Schönherr and J. Maier, Proton and oxygen diffusion in BaCeO_3 based compounds: A combined thermal gravimetric analysis and conductivity study	278
B. Zhu and B.-E. Mellander, Proton conduction in nitrate-based oxides and related ceramics at intermediate temperatures	285
T. Tsuji, T. Suzuki and H. Iwahara, Electrical conduction in BaThO_3 doped with Nd_2O_3	291
R.E. Lechner, N.A. Dencher, J. Fitter and Th. Dippel, Two-dimensional proton diffusion on purple membrane	296
Y. Larring and T. Norby, Protons in LaErO_3	305
S. Aschrafi-Mahabadi, M. Cappadonia and U. Stimming, Proton transport in solid electrolytes with clathrate structure	311
Y. Sone, A. Kishimoto and T. Kudo, Amorphous tantalum oxide proton conductor derived from peroxo-polyacid and its application for EC device	316
GLASSES I and II	
D. Wilmer, T. Kantimm, O. Lamberty, K. Funke, M.D. Ingram and A. Bunde, Electrical and mechanical mixed alkali effect in a lithium/sodium borate glass at GHz frequencies	323
N. Machida, H. Tanaka, T. Shigematsu, N. Nakanishi and T. Minami, Preparation of silver ion conducting glasses containing two kinds of oxoanions and enhancement of conductivity of the glasses	328
J. Kuwano, N. Sato, M. Kato and K. Takano, Ionic conductivity of $\text{LiM}_2(\text{PO}_4)_3$ ($\text{M} = \text{Ti, Zr, Hf}$) and related compositions	332
J.L. Souquet, M. Lévy and M. Duclot, A single microscopic approach for ionic transport in glassy and polymer electrolytes	337

M. Wasiucionek, J. Garbarczyk, P. Kurek and W. Jakubowski, Electrical properties of glasses of the $\text{Na}_2\text{O}-\text{V}_2\text{O}_5-\text{P}_2\text{O}_5$ system	346
S. Souto, M. Massot and M. Balkanski, Raman scattering and medium range order in ternary borate glasses	350
D. Knödler, P. Pendzig and W. Dieterich, Transport and ac response in a model of glassy electrolytes	356
Y. Hiki, H. Takahashi and Y. Kogure, Study of the thermal transport properties of superionic conducting glasses	362
A. Guessous, J. Sarradin, A. Pradel and M. Ribes, Electrochemical characterization of thin films of ionically and mixed conducting glasses	368
P. Benassi, A. Fontana and E. Cazzanelli, Quasi-elastic light scattering in glasses	375
S. Goldammer, A. Runge and H. Kahnt, New fluoride-conducting glass-ceramics in the system $\text{SiO}_2-\text{PbO}-\text{PbF}_2$	380
Ch. Kaps, D. Beyer and R. Schubert, Evidence for fast Na^+ transport in glassy $\text{Na}_4\text{TaP}_3\text{O}_{12}$	385
H. Takahashi, Y. Hiki, T. Sakuma and S. Funahashi, The structure of $\text{AgI}-\text{CsI}$ glass	390
M. Tatsumisago, T. Saito and T. Minami, Low temperature behavior of frozen $\alpha\text{-AgI}$ in rapidly quenched glass matrices	394
INSERTION COMPOUNDS	
B. Zachau-Christiansen, K. West, T. Jacobsen and S. Skaarup, Insertion of lithium into the manganese dioxides: pyrolusite and ramsdellite	401
D.M. Schleich, Chimie douce: Low temperature techniques for synthesizing useful compounds	407
E. Cazzanelli, G. Mariotto, S. Passerini and F. Decker, Spectroscopic investigations of Li-intercalated V_2O_5 polycrystalline films	412
R.A. Huggins, H. Prinz, M. Wohlfahrt-Mehrens, L. Jörissen and W. Witschel, Proton insertion reactions in layered transition metal oxides	417
M. Inagaki and N. Iwashita, Chemical charging and electrochemical discharging through graphite intercalation compounds with sulfuric acid	425
Y.J. Shan, L. Chen, Y. Inaguma, M. Shikano, M. Itoh and T. Nakamura, Lithium insertion into ceramic $\text{SrVO}_{3-\delta}$	429
W. Küchler, P. Heitjans, A. Payer and R. Schöllhorn, ^7Li NMR relaxation by diffusion in hexagonal and cubic Li_xTiS_2	434
L. Hernán, J. Morales, L. Sánchez and J.L. Tirado, Electrochemical alkali metal intercalation into $(\text{BiS})_{1.17}(\text{NbS}_2)_2$	439
J.T.S. Irvine, S. Thiemann, G. Mather, A.A. Finch and H. Tukamoto, Electrochemical lithium insertion into magnesium titanate spinels	445
N. Kumagai, M. Abe, N. Kumagai, K. Tanno and J.P. Pereira-Ramos, Kinetics of electrochemical insertion of lithium into WO	451

FUNDAMENTAL STUDIES III, SPECTROSCOPIC METHODS

- D. Beyer, Ch. Kaps, A. Müller, C.J. Carlile and R. Hempelmann, A combined radioactive tracer and quasielastic neutron scattering study of sodium diffusion in sodium silicate glass 461
- F. Rocca, A. Kuzmin, J. Purans and G. Mariotto, EXAFS study of Nd³⁺-exchanged β'' -alumina crystal 465
- T. Hattori, H. Yugami and M. Ishigame, Luminescence from Cr³⁺ ions in mixed-cation β -alumina crystals 471
- P. Berthet, E. Bretey, J. Berthon, F. d'Yvoire, A. Belkebir, A. Rulmont and B. Gilbert, Structure and ion transport properties of Na₂O–Ga₂O₃–P₂O₅ glasses 476
- D. Clausen, I. Burmester, P. Heitjans and A. Schirmer, ⁷Li-NMR on β -LiAl: Diffusion and electronic properties 482
- F. Tietz, E. Zanghellini and G. Mariotto, Optical spectroscopy of praseodymium-exchanged Na⁺ β -alumina crystals 488
- T. Hattori, S. Yashima, I. Kawaharada, Y. Chiba, M. Ishigame, N. Sata and S. Shin, Vacuum-ultraviolet reflectance in β -aluminas 493
- K.D. Becker, J. Pattanayak and S. Wißmann, A high-temperature Mössbauer study of the cation distribution in (Fe,Mn)₃O₄ spinels 497

FUNDAMENTAL STUDIES IV, MODELLING

- H.J. Schütt, Determination of the free ionic carrier concentration: A discussion of different methods 505
- C.R.A. Catlow and R.G. Bell, Ions and ionic motion in microporous materials 511
- H. Kawaji and T. Atake, Heat capacity measurement and thermodynamic study of Ag₈GeTe₆ 518
- J.X.M. Zheng-Johansson, K. Sköld and J.-E. Jørgensen, Self diffusion study of copper halides using tracer methods 522
- E. Ahlgren and F.W. Poulsen, Thermoelectric power of YSZ 528
- S.F. Potamianou and K.A.Th. Thoma, A study of ion transport in zirconia through computer modeling 533
- E. Wolska, W. Szajda and P. Piszora, Mechanism of Al- for Fe-substitution during the α -(Fe, Al)OOH \rightarrow γ -(Fe, Al)₂O₃ transformation 537
- D.R. Franceschetti, Electrical network models for coupled charge transport 542

SENSORS

- K. Gomyo, I. Sakaguchi, Y. Sin-ya, V.I. Lakshmanan, A. McLean and M. Iwase, Solid state sensor for silicon in molten metals by zirconia-based electrolyte 551
- F. Li, Z. Zhu and L. Li, A new way extending working-life of oxygen sensors in melt 555
- M. Benammar and W.C. Maskell, An oxygen sensor based upon a zirconia pump-gauge operated in a novel mode providing a linear output 559

K. Huang, Y. Xia, W. Wu, Q. Liu, W. Liu and H. Clauss, Investigations on commercially available MgO-PSZ electrolytes with Y ₂ O ₃ -FSZ coating for low oxygen determination in liquid steel	563
S. Ikeda, S. Kato, K. Nomura, K. Ito, H. Einaga, S. Saito and Y. Fujita, Carbon dioxide sensor using solid electrolytes with zirconium phosphate framework	569
N. Miura, S. Yao, Y. Shimizu and N. Yamazoe, New auxiliary sensing materials for solid electrolyte NO ₂ sensors	572
R.C. Copcutt and W.C. Maskell, A zirconia amperometric pump-gauge sensor operated in gases containing SO ₂ or NO: Leakage and electrode overvoltage studies	578
F.W.H. Dean and D.J. Fray, A low temperature hydrogen in steel potentiometric sensor	584
R.V. Kumar and D.J. Fray, Application of novel sensors in the measurement of very low oxygen potentials	588
M. Zheng and X. Chen, Preparation and electrochemical characterization of SrCeO ₃ -based proton conductor	595
A. Wakagi, J. Kuwano, M. Kato and H. Hanamoto, Fast amperometric response of ambient temperature oxygen sensor based on PbSnF ₄ ; Iron(II) phthalocyanine-based sensing electrodes containing carbon microbeads	601
W. Wu, S. Tang, S. Hui and Q. Liu, Development of long-term oxygen sensor in molten copper using MgO-PSZ electrolyte	606

THIN FILMS

R.B. Goldner, F.O. Arntz, K. Dickson, M.A. Goldner, T.E. Haas, T.Y. Liu, S. Slaven, G. Wei, K.K. Wong and P. Zerigian, Some lessons learned from research on a thin film electrochromic window	613
J.B. Bates, G.R. Gruzalski, N.J. Dudney, C.F. Luck and X. Yu, Rechargeable thin-film lithium batteries	619
E. Caudron, G. Baud, J.P. Besse, M. Jacquet and G. Blondiaux, Elaboration and ionic conductivity of Li-Al-O thin films	629
S. Takano, A. Kishimoto, K. Hinokuma and T. Kudo, Electrochromic thin films coated from peroxo-polymolybdate solutions	636
A. Turković, D. Šokčević and Z. Šipuš, Electrical properties of thin films Zn/(PEO) ₄ ZnCl ₂ /XO _y , SnO ₂ (X=Mn, Ti, Zn; y=1, 2) galvanic cells	642

BATTERIES

C. Poinignon, J.M. Amarilla and F. Tedjar, Electrochemical reduction of β-MnO ₂ , ramsdellite, γ- and ε-MnO ₂	649
F. Bonino, F. Croce and S. Panero, Electrochemical characterization of an ambient temperature rechargeable Li battery based on low molecular weight polymer electrolyte	654
K. Iwamoto, N. Aotani, K. Takada and S. Kondo, Rechargeable solid state battery with lithium conductive glass, Li ₃ PO ₄ -Li ₂ S-SiS ₂	658

A.G. Ritchie, High temperature electrochemical discharges of lithium-copper oxide cells using solid electrolytes	662
W.P. Hagan, R.J. Latham, R.G. Linford and S.L. Vickers, Zinc polymer electrolytes in battery systems	666
NEW CONCEPTS	
M. Aniya, Superionicity as a local fluctuation of the chemical bond	673
C.G. Granqvist, Electrochromic oxides: A unified view	678
S. Ling, Chemistry of high-concentration point defects: a novel statistical thermodynamic approach applied to calcium-doped cerium oxides	686
A. Talaie and G.G. Wallace, Resistometry: A new characterisation technique for conducting polymers	692